

REMARKS

We are in receipt of the Office Action dated June 21, 2001, and the above amendment and the following remarks are made in light thereof.

Claims 1-31 are pending in the application. In the Office Action, Claims 1-31 are rejected under 35 U.S.C. §112 for indefiniteness. Additionally, Claims 1-31 stand rejected under 35 U.S.C. §103 as being unpatentable over Wu 6,177,323 in view of Kobayashi 6,144,094.

Turning first to the rejections under 35 U.S.C. §112, Claims 2-6, 8-12, 14-18, and 20-24 have been amended to clarify the "devices" of the claims. Specifically, the claims have been amended so that they are directed to a semiconductor device and, with respect to dependent claims 4-6, 10-12, 16-18, and 22-24, a semiconductor device that is incorporated into a particular device.

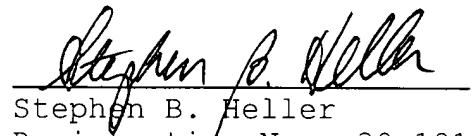
In addition, claims 1 and 7 have been amended to address the Examiner's question as to whether the gate insulating film includes "any other layers." Specifically, claims 1 and 7 have been amended to make clear that the gate insulating film comprises at least a single layer. See the specification at page 11, lines 15-22.

Turning to the Examiner's rejections under 35 U.S.C. §103, the Examiner cites Wu for showing a gate dielectric layer which may be comprised of a oxynitride composition, which, in turn, may be doped with boron, citing column 4, line 42 - column 5, line 30. The Examiner cites Kobayashi for also showing a FET structure in which the gate dielectric may be formed of an oxynitride layer which is also doped with boron, citing columns 4 and 5.

In contrast, the present invention is generally directed to a silicon nitride oxide film containing boron (SiN_xB_yO_z) intentionally formed by a sputtering method -- not by diffusion -- as a gate insulating film that is in contact with a source region, a drain region, and a channel formation region. Because the references cited by the examiner disclose merely a silicon nitride oxide film, they do not disclose or suggest the invention.

Applicant believes that the claims are now in condition for allowance, and an early Office Action in this regard is earnestly solicited.

Respectfully submitted,


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of)
Shunpei YAMAZAKI)
Serial No.: 09/479, 262)
Filed: January 5, 2000)
Art Unit: 2815)
Examiner: E. Wojciechowicz)
For: Semiconductor Device and)
Method of Manufacturing)
the Same)

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) A semiconductor device comprising:
a gate electrode formed on an insulating surface;
a gate insulating film comprising at least a single
layer on said gate electrode; and
a source region, a drain region, and a channel
formation region formed between said source region and said drain
region, the respective regions begin in contact with said gate
insulating film;
wherein said gate insulating film includes a layer of a
silicon nitride oxide film containing boron.
2. (Amended) A semiconductor device according to claim 1,
wherein a composition ratio of boron in said silicon nitride
oxide film is 0.1 to 50 atoms%.

3. (Amended) A semiconductor device according to claim 1, wherein a composition ratio of oxygen in said silicon nitride oxide film is 1 to 30 atoms%.

4. (Amended) A semiconductor device according to claim 1, wherein said semiconductor device is [one] incorporated into a device selected from the group consisting of an electro-optical device and an electronic equipment.

5. (Amended) A semiconductor device according to claim 4, wherein said electro-optical device is one selected from the group consisting of a liquid crystal display device, an EL display device, an EC display device, and an image sensor.

6. (Amended) A semiconductor device according to claim 4, wherein said electronic equipment is one selected from the group consisting of a video camera, a digital camera, a projector, a goggle display, a car navigation system, a personal computer, and a portable information terminal.

7. (Amended) A semiconductor device comprising:
a source region, a drain region, and a channel formation region formed between said source region and said drain region, the respective regions being in contact with an insulating surface;

a gate insulating film comprising at least single layer on said channel formation region; and

a gate electrode to be in contact with said gate insulating film;

wherein said gate insulating film includes a layer of a silicon nitride oxide film containing boron.

8. (Amended) A semiconductor device according to claim 7, wherein a composition ratio of boron in said silicon nitride oxide film is 0.1 to 50 atoms%.

9. (Amended) A semiconductor device according to claim 7, wherein a composition ratio of oxygen in said silicon nitride oxide film is 1 to 30 atoms%.

10. (Amended) A semiconductor device according to claim 7, wherein said semiconductor device is [one] incorporated into a device selected from the group consisting of an electro-optical device and an electronic equipment.

11. (Amended) A semiconductor device according to claim 10, wherein said electro-optical device is one selected from the group consisting of a liquid crystal display device, an EL display device, and EC display device, and an image sensor.

12. (Amended) A semiconductor device according to claim 10 wherein said electronic equipment is one selected from group consisting of a video camera, a digital camera, a projector, a goggle display, a car navigation system, a personal computer, and a portable information terminal.

14. (Amended) A semiconductor device according to claim 13, wherein a composition ration of boron in said silicon nitride oxide film is 0.1 to 50 atoms%.

15. (Amended) A semiconductor device according to claim 13, wherein a composition ratio of oxygen in said silicon nitride oxide film is 1 to 30 atoms%.

16. (Amended) A semiconductor device according to claim 13, wherein said semiconductor device is [one] incorporated into a device selected from the group consisting of an electro-optical device and an electronic equipment.

17. (Amended) A semiconductor device according to claim 16, wherein said electro-optical device is one selected from group consisting of a liquid crystal display device, an EL display device, an EC display device, and an image sensor.

18. (Amended) A semiconductor device according to claim 16, wherein said electronic equipment is one selected from the group consisting of a video camera, a digital camera, a projector, a goggle display, a car navigation system, a personal computer and a portable information terminal.

20. (Amended) A semiconductor device according to claim 19, where a composition ratio of boron in said silicon nitride oxide film is 0.1 to 50 atoms%.

21. (Amended) A semiconductor device according to claim 19, wherein a composition ratio of oxygen in said silicon nitride oxide film is 1 to 30 atoms%.

22. (Amended) A semiconductor device according to claim 19, wherein said semiconductor [device] is [one] incorporated into a device selected from the group consisting of an electro-optical device and an electronic equipment.

23. (Amended) A semiconductor device according to claim 22, wherein said electro-optical device is one selected from the group consisting of a liquid crystal display device, an EL display device, an EC display device, and an image sensor.

24. (Amended) A semiconductor device according to claim 22, wherein said electronic equipment is one selected from the group consisting of a video camera, a digital camera, a projector, a goggle display, a car navigation system, a personal computer, and a portable information terminal.